

REMARKS

Claims 1, 2, 3, 6, 8, 11, 13, 20, 22, 23, 26, 27, 30, 36, 37, 45 and 48-53 are amended.

Claims 1-3, 6, 8, 11, 13, 20, 22, 23, 26, 27, 30, 31, 36, 37, 45, and 48-53 are allowed.

The Examiner states the claims are in condition for allowance except for alleged formal matters wherein the Examiner provides proposed amendments to each claim except claim 2 (pgs. 2-4 of paper no. 33).

To move the case forward, and without admitting to the propriety of any of the Examiner's proposed amendments, Applicant has amended the claims as shown.

Regarding other proposed amendments by the Examiner, the Examiner is respectfully reminded that "[a] fundamental principle ... is that applicants are their own lexicographers [and] [t]hey can define in the claims what they regard as their invention essentially in whatever terms they choose...." MPEP §2173.01 (8th ed.). Accordingly, without a rejection against the claims wherein the Applicant is afforded the opportunity to rebut the rejection, the request to amend the claims by the Examiner's proposed amendments is inappropriate and should be withdrawn.

Applicant has not amended claim 1, line 5; claim 3, lines 1 and 4; etc., or has presented alternative language inasmuch as such suggestions are nonsensical and/or do not clearly reflect Applicant's intent.

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No amendment made was related to the statutory requirements of patentability unless expressly stated herein. Further, no amendment made was for the purpose of narrowing the scope of any claim, unless Applicant has argued herein that such amendment was made to distinguish over a particular reference or combination of references. The amendments made herein now more positively express limitations which were previously inherent in such claim(s), and accordingly are not for the purpose of narrowing and do not effectively narrow the scope of any claim.

Attached hereto is a marked-up version of the changes made to the specification and claims by the current amendment. The attached page(s) are captioned "**A Version with markings to show changes made.**"

This application is now believed to be in immediate condition for allowance, and action to that end is respectfully requested. If the Examiner's next anticipated action is to be anything other than a Notice of Allowance, the undersigned respectfully requests a telephone interview prior to issuance of any such subsequent action.

Respectfully submitted,

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application Serial No. 09/148,723
Filing Date September 3, 1998
Inventor Warren M. Farnworth et al.
Assignee Micron Technology, Inc.
Group Art Unit 3729
Examiner A.D. Tugbang
Attorney's Docket No. MI22-981
Title: Methods of Bonding Solder Balls to Bond Pads on a Substrate

VERSION WITH MARKINGS TO SHOW CHANGES MADE
ACCOMPANYING RESPONSE TO NOVEMBER 5, 2002
EX PARTE QUAYLE OFFICE ACTION

In the Claims

The claims have been amended as follows. Underlines indicate insertions and ~~strikeouts~~ indicate deletions.

1. (Amended) A method of bonding balls of solder to bond pads on a substrate comprising:

dipping the substrate into a volume of the balls of solder;
contemporaneously retaining at least two of the balls of solder over different respective bond pads on the substrate in ~~the~~ absence of flux; and
with the at least two balls of solder so retained, exposing the at least two balls of solder to bonding conditions effective to bond the at least two balls of solder with ~~their~~ the associated bond pads.

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2. (Amended) The method of claim 1, wherein the exposing comprises laser-bonding the at least two balls of solder.

3. (Amended) A method of bonding balls of solder to bond pads on a substrate comprising:

placing at least portions of a plurality of balls of solder within a frame and in registered alignment with individual bond pads over the substrate by dipping the substrate into a volume of the balls of solder; and

while the ball portions are within the frame, exposing the balls of solder to bonding conditions effective to bond the balls of solder with ~~their~~ the associated bond pads.

6. (Amended) The method of claim 3, wherein the exposing comprises laser bonding the balls with ~~their~~ the associated bond pads.

8. (Amended) The method of claim 3, wherein the exposing comprises laser bonding the balls with ~~their~~ the associated bond pads by fixing the position of a laser beam and moving the frame relative to the laser beam from ~~ball-to-ball~~ one of the balls to another of the balls.

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11. (Amended) The method of claim 3, wherein:

the placing comprises placing individual balls within individual holes within the frame; and

the exposing comprises reflowing the balls while the balls are within ~~their~~ the individual holes, and further comprising, after reflowing, removing the frame from around the reflowed balls.

13. (Amended) A method of bonding balls of solder to bond pads on a substrate comprising:

providing a frame having a plurality of holes sized to receive individual solder balls;

delivering the individual balls of solder into the holes from over the frame by dipping the substrate into a volume of the balls of solder;

placing the balls into registered alignment, while the balls are in the holes, with a plurality of individual associated bond pads over the substrate; and

bonding the balls with ~~their~~ the individual associated bond pads.

20. (Amended) The method of claim 13, wherein the bonding comprises laser bonding the balls with ~~their~~ the individual associated bond pads.

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22. (Amended) The method of claim 13, wherein the bonding comprises laser bonding the balls with ~~their~~ the individual associated bond pads by fixing ~~the~~ a position of a laser beam and moving the frame relative to the laser beam from ~~ball-to-ball~~ one of the balls to another of the balls to effectuate the bonding.

23. (Amended) A method of bonding solder balls to bond pads on a substrate comprising:

providing a frame having a plurality of holes;

inserting individual solder balls into the holes by dipping the substrate into a volume of the balls of solder, the balls being small enough to pass through the holes;

placing the frame into proximity with the substrate having bond pads positioned thereon, more than one of the plurality of holes individually holding an individual solder ball therewithin and in registered alignment with an associated bond pad on the substrate;

laser-bonding the solder balls to ~~their individual~~ the associated bond pad;
and

after the laser bonding, removing the frame from proximity with the substrate.

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26. (Amended) The method of claim 23, wherein said laser-bonding comprises moving the individual solder balls relative to a generally-fixed laser beam.

27. (Amended) A method of bonding a ball of solder to a bond pad on a substrate comprising:

providing a the frame having a hole;

providing a ball of solder having an outer surface;

retaining the ball of solder within the hole in an ambient processing environment which is generally uniform over the an entirety of the ~~ball's~~ outer surface of the ball by dipping the substrate into a volume of ~~the~~ balls of solder; and

while the ball of solder is within the hole, bonding the ball of solder with an associated bond pad on the substrate.

30. (Amended) The method of claim 27, wherein the bonding comprises laser bonding the ball.

36. (Amended) The method of claim 31, wherein the bonding comprises laser-bonding each ball to an associated one of the individual associated bond pads.

37. (Amended) The method of claim 31, wherein the bonding comprises laser-bonding each ball to an associated one of the individual associated bond pads by fixing ~~the~~ a position of a laser beam and moving each ball into ~~the~~ a path of the laser beam.

45. (Amended) The method of claim 1, wherein the exposing comprises melting the at least two balls.

48. (Amended) A method of bonding balls of solder to bond pads on a substrate comprising:

placing at least portions of a plurality of balls of solder within a frame and in registered alignment with individual bond pads over the substrate by dipping the substrate into a volume of the balls of solder; and

while ~~the ball~~ portions of the balls of solder are within the frame, exposing the balls to bonding conditions effective to bond the balls with ~~their associated~~ the individual bond pads by laser bonding the balls with ~~their associated~~ the individual bond pads.

49. (Amended) The method of claim 48, wherein the exposing the balls to bonding conditions effective to bond the balls comprises laser bonding the balls with ~~their associated~~ the individual bond pads by fixing ~~the~~ a position of a laser beam and moving the frame relative to the laser beam from ~~ball-to-ball~~ one of the balls to another of the balls.

50. (Amended) The method of claim 48, wherein:

the placing comprises placing individual balls within individual holes within the frame; and

the exposing the balls to bonding conditions effective to bond the balls comprises reflowing the balls by laser bonding while the balls are within ~~their~~ the individual holes, and further comprising, after reflowing, removing the frame from around the reflowed balls.

51. (Amended) A fluxless process for bonding balls of solder to bond pads on a substrate comprising:

placing at least portions of a plurality of balls of solder within a frame and in registered alignment with individual bond pads over the substrate by dipping the substrate into a volume of the balls of solder; and

while ~~the ball~~ portions of the balls of solder are within the frame, laser bonding the balls with the individual bond pads by laser bonding the balls of solder to the individual bond pads using a fixed laser beam.

52. (Amended) The fluxless process of claim 51, wherein the laser bonding the balls to ~~their associated~~ the individual bond pads comprises fixing ~~the~~ a position of the laser beam and moving the frame relative to the laser beam from ~~ball-to-ball~~ one of the balls to another of the balls.

53. (Amended) The fluxless process of claim 51, wherein:

the placing comprises placing individual balls of solder within individual holes within the frame; and

the laser bonding the balls to the individual bond pads comprises reflowing the balls by laser bonding while the balls are within the individual holes, and further comprising, after reflowing, removing the frame from around the reflowed balls.

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